

Wound infection caused by *Lichtheimia ramosa* due to a car accident



Evangelia Bibashi^a, G. Sybren de Hoog^b, Theodoros E. Pavlidis^c, Nikolaos Symeonidis^c, Athanasios Sakantamis^c, Grit Walther^{b,*}

^a Department of Microbiology, Hippokration General Hospital, 49, Konstantinoupolis Str., GR-546 42 Thessaloniki, Greece

^b CBS-KNAW Fungal Biodiversity Centre, Uppsalalaan 8, 3584 CT Utrecht, The Netherlands

^c 2nd Propedeutical Surgical Department, Medical School, Aristotle University of Thessaloniki, Hippokration General Hospital, 49, Konstantinoupolis Str., GR-546 42 Thessaloniki, Greece

ARTICLE INFO

Article history:

Received 29 November 2012

Accepted 4 December 2012

Keywords:

Lichtheimia
Mucorales
Mucormycosis
Zygomycetes
Trauma

ABSTRACT

A 32-year-old immunocompetent man sustained severe traumas contaminated with organic material due to a car accident. An infection caused by *Lichtheimia ramosa* at the site of contamination was early diagnosed and cured by multiple surgical debridement and daily cleansing with antiseptic solution only.

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1. Introduction

The genus *Lichtheimia* (syn. *Mycocladius*, *Absidia* pro parte) belongs to the order Mucorales and includes saprotrophs isolated from soil, decaying plant material or dung [1,2]. Three out of five currently accepted species, namely *Lichtheimia corymbifera*, *L. ornata* and *L. ramosa* are known to cause human infections (mucormycoses) predominantly in patients with impaired immune systems [2]. The awareness of the thermotolerant genus *Lichtheimia* increased markedly since its separation from the mesophilic genus *Absidia* [3] and its taxonomic revision [2] and resulted in a significantly higher number of reports of infections assigned to *Lichtheimia*. In one decade the proportion of mucormycoses caused by *Lichtheimia* species given by comprehensive studies rose from 5% [4] to e.g. 19% [5], 24.4% [6] or 29% [7].

The majority of cases caused by *Lichtheimia* species relate to patients that are severely debilitated due to malignancies, poorly controlled diabetes or solid organ transplantation [6]. Cutaneous [8,9], pulmonary [10–12], rhinal [13], rhinocerebral [12], renal [14], and disseminated infections [15,16] as well as otomycosis [17] have been described and hence the spectrum of infections due to *Lichtheimia* spp. is similar to that of other members of the Mucorales. Sun et al. [10] found patients infected by *Lichtheimia corymbifera*

(as *Mycocladius corymbifer*) more likely to acquire a disseminated infection.

The pathogenic *Lichtheimia* species *L. corymbifera*, *L. ornata* and *L. ramosa* are morphologically similar and were considered to constitute a single species '*Absidia corymbifera*' for several decades. For that reason case reports on infections by *Lichtheimia corymbifera* (syn. *Absidia corymbifera*, *Mycocladius corymbifer*) published between 1974 [18] and 2009 [19] might in fact refer to *L. ornata* or *L. ramosa*. Except of Borrás et al. [20] and Transmonte et al. [21], who described possible infections due to *Lichtheimia ramosa*, our case is the only report on a *Lichtheimia ramosa* infection proven by direct microscopy of the specimen and by molecular identification.

Soil serves as habitat and spore reservoir for *Lichtheimia* species. Several cases are known where traumatic injuries contaminated with soil resulted in *Lichtheimia* infections in immunocompetent patients e.g. [22–26]. *Lichtheimia corymbifera* was considered to be the pathogen in all cases where the aetiological agent was morphologically identified to the species level. Because of the morphological similarity of the tree pathogenic *Lichtheimia* species previously unified as *A. corymbifera*, older case reports might have concerned *L. ornata* or *L. ramosa*. In the present case report, we describe a *Lichtheimia ramosa* mycosis in a patient who had severe traumatic injury because of a car accident. The aetiological agent was identified morphologically and molecularly.

2. Case

We present a case of a 32-year-old male who was admitted to the emergency room after an automobile accident. At the time of

* Corresponding author. Tel.: +49 3641 5321038; fax: +49 3641 5320803.

E-mail address: grit_walther44@yahoo.de (G. Walther).

¹ Present address: Institute of Microbiology, Department of Microbiology and Molecular Biology, University of Jena, 07743 Jena, Germany.

² Present address: Leibniz-Institute for Natural Product Research and Infection Biology—Hans-Knöll-Institute, Jena Microbial Resource Collection, 07745 Jena, Germany.

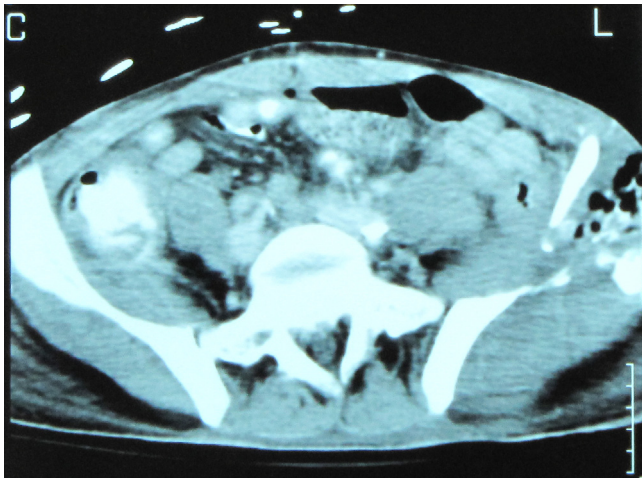


Fig. 1. CT scan demonstrating a subcutaneous cavity on the left lumbar region.

the crash the patient was ejected out of the vehicle and collided with a tree. On admission (day 0) he was fully alert but hemodynamically unstable. X-rays showed multiple fractures in the lower extremities, fractures of the left iliac bone, multiple fractures of the left costal bones and left-sided hemothorax. He also had a puncture wound in the left lumbar region, from which pieces of wood and soil were removed. Transcutaneous peritoneal lavage was positive for blood so he was rushed to the operation room. Upon laparotomy, splenic rupture and perforation of the jejunum was found. Splenectomy, excision of the perforated segment of jejunum with end-to-end jejunojejunal anastomosis, and debridement of the puncture wound was performed (day 0). A chest drain was inserted for the treatment of the hemothorax (day 0). Several hours following the operation (day +1) the patient developed acute respiratory distress syndrome and he was kept under mechanical ventilation for 25 days. A postoperative CT scan (day +4) demonstrated a subcutaneous cavity in the left lumbar region anterior to the left psoas muscle containing air and pus, which resulted from the puncture wound (Fig. 1). Cultures taken from the purulent fluid

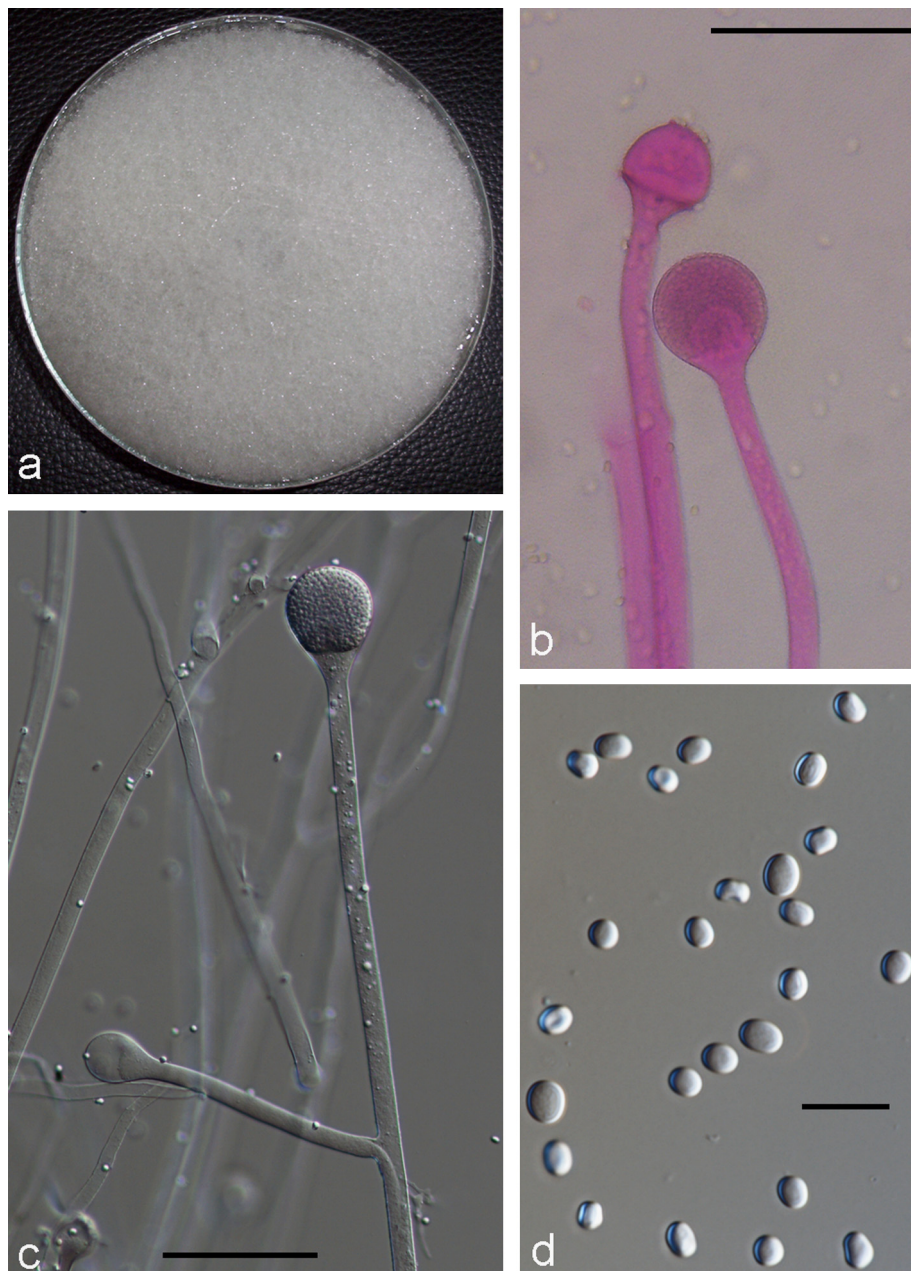


Fig. 2. Macro- and micromorphology of strain CBS 124197 of *Lichtheimia ramosa*: (a) colony surface after 3 days at 30 °C; (b) sporangiophores, one with intact sporangium and columella and one with columella after the rupture of the sporangium, stained with lactofuchsin, scale bar=100 µm; (c) branched sporangiophore bearing a young and a mature sporangium, scale bar 100 µm; (d) sporangiospores, scale bar=10 µm.

of the abscess at two different times (days +4 and +16) revealed the presence of a fungus.

Cultures from two specimens (taken at days +4 and +16) of the abscess on Sabouraud's dextrose agar yielded a filamentous fungus with rapid growth at 35 °C (Fig. 2). The colonies were cream and cottony with an uncoloured reverse even with age. The direct microscopic examination of the specimen from the purulent fluid revealed broad, rarely septated hyphae. In the subsequent microscopic study of the corresponding isolate sporangiophores and sporangia were found assigning the fungus to the order Mucorales (Fig. 2). The strain was sent to CBS-KNAW Fungal Biodiversity Centre for species identification where it is deposited with accession number CBS 124197. DNA extraction, PCR amplification and sequencing of the internal transcribed spacer region (ITS) of the nuclear ribosomal RNA genes were performed as described in detail by Alastruey-Izquierdo et al. [2]. The ITS sequence that is deposited at GenBank under the accession number GQ342870 clearly identifies the studied strain CBS 124197 as *Lichtheimia ramosa*. In the ITS tree published in Alastruey-Izquierdo et al. [2] the strain CBS 124197 shares a supported clade with the ex-neotype strain of *L. ramosa* CBS 582.65.

The puncture wound was subjected to daily thorough cleansing with antiseptic solution (povidone iodine 10%, Betadine®, Mundipharma A.G., Switzerland) starting at day +4 and surgical debridement every 2–3 days and left to heal by secondary intention. Multiple cultures from blood, urine and bronchial excretions were taken on days +6, +16 and +25, and in addition a variety of pathogenic bacteria were isolated (*Acinetobacter baumannii*, *Staphylococcus epidermidis*, *Enterococcus faecium*). Appropriate broad-spectrum antibiotics (ciprofloxacin 400 mg twice daily, metronidazole 500 mg 3 times daily, gentamicin 80 mg 3 times daily) were administered according to sensitivity tests on days +10, +20 and +29. On day +48 the patient was discharged from the surgical department and after two months in a rehabilitation centre he recovered fully.

3. Discussion

In the present case, traumatic implantation of *Lichtheimia ramosa* caused local mucormycosis in an immunocompetent patient. Although both medical and surgical treatment is usually required, in our case the patient was diagnosed in an early stage and successfully managed with surgical debridement combined with cleansing with antimycotic solution, without the need for systemic antimycotics. Fazii et al. [27] described a mycosis due to *L. corymbifera* in a young male patient with multiple traumatic fractures that was also healed by surgical debridement and revascularization only.

About 40% of the patients sustaining cutaneous mucormycosis are immunocompetent. Trauma is the most important predisposing factor for this sort of infection in patients with normal immune response. In contrast, disseminated infections are restricted to immunocompromised hosts [28]. There are also cases of nosocomial cutaneous mucormycosis where the pathogen entered the human body via surgical wound sites or insertion sites of intravenous catheters [29].

Infections of immunocompetent hosts have occasionally been reported from all important pathogenic mucoralean species including *Lichtheimia* [30–32]. However, *Apophysomyces* species and *Saksenaea vasiformis*, showing good growth at human body temperature, prevalently cause deep infections in immunologically normal hosts [32]. *Mucor irregularis* (syn. *Rhizomucor variabilis*) has a maximum growth temperature of 38 °C and causes chronically evolving superficial or subcutaneous mycoses predominantly in hosts with normal immune response [33].

The clinical manifestation of cutaneous mucormycosis ranges from non-healing ulcers to rapidly proliferating necrotising fasciitis [34]. Necrotising fasciitis caused by *Apophysomyces elegans* [35] or *Rhizopus arrhizus* [36] has also been observed in immunocompetent hosts. Uncontrolled necrosis is often associated with large deep wounds [36–39], but one case was published describing a small laceration of the arm resulting in a necrotising fasciitis [40]. After the volcanic cataclysm in Columbia in 1985 a high number of injured patients developed a necrotising fasciitis caused by *Rhizopus arrhizus*, probably because victims had been submerged in volcanic mud for 12 to 72 h [36]. Thus, the risk for the development of an uncontrolled necrosis seems to rise with size of the injury, the degree of contamination with soil or other organic material, and with the length of the contact period. Vainrub et al. [41] explained the development of necrotising mucormycosis in immunologically normal hosts with an extensive damage of tissue resulting in an insufficient host response combined with soil contamination. The fungal spores germinate and the fast growing mycelium invades blood vessels, leading in turn to a reduced blood supply and vitality of the tissue, followed by necrosis [41,42] and possibly also to decreased levels of antifungals in the tissue [37]. Therefore intensive debridement should be included in the treatment of this infection for cure [28,37].

Cutaneous mucormycosis is an uncommon infection that must be considered in immunosuppressed patients, but also in immunocompetent patients who sustained extensive trauma with soil contamination.

Conflict of interest

There are none.

Acknowledgements

We are grateful to Richard Summerbell for providing the genus identification of the isolate and for arranging this collaboration.

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